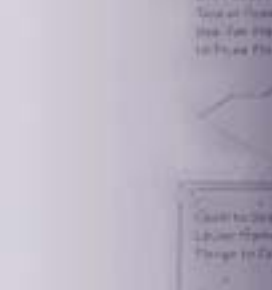
# Buildings for the 21st Century

Summer 2001 | News You Can Use

Office of Building Technology, State and Community Programs



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## Technology Roadmaps Advance Buildings Industry

Engaging more than 500 industry leaders, a BTS effort to create a long-term vision for the building industry is well underway. Through cooperation and resource alignment, this technology roadmap initiative is developing strategies for more efficient, cost-effective and adaptable buildings.

Recent developments include completion of the ***Building Envelope Technology Roadmap*** and implementation of the ***Window Industry Technology Roadmap***. These industry-led roadmaps will help chart the course of the building envelope industry—which produces walls, floors and ceilings—and the window industry for the next 20 years. Roadmaps for lighting and commercial buildings were released last year and are also being implemented.

**Building Envelope**—By 2020, the building industry envisions envelopes that are net producers of energy, with movable walls, and rooms that adapt to changing needs and environmental factors. Intelligent features will adjust interior climate based on weather, and will provide naturally derived lighting and ventilation, enhancing overall comfort and occupant health. Homes and their construction will be resource-efficient, and increased durability will reduce maintenance effort and cost.

To fulfill this vision, the industry identified 120 joint government and industry research activities and identified strategies to overcome major barriers to technological progress, including consumer and builder acceptance of innovative building envelopes. Through competitive solicitations, DOE will select research partners and projects based on factors such as energy and dollar impact, likelihood of success, and consistency with the technology roadmap.

**Windows**—The window industry released a roadmap last year, and now five industry/government research projects are underway that will help homeowners and businesses manage their heating and cooling costs. All projects were selected through a competitive solicitation and are cost-shared collaborations between BTS and its industry partners. Projects include work on window insulation and glazing, and integrated window and wall systems.

**Commercial Buildings**—Released last fall, ***High-Performance Commercial Buildings: A Technology Roadmap*** embraces the whole-buildings approach—crossing disciplines to consider all of the building components and subsystems together—enabling industry to create more effective and efficient buildings. The roadmap will combine efforts in such fields as energy efficient building shells, lighting, windows, heating and cooling and sophisticated controls.

**Lighting**—Released last year, ***Vision 2020: The Lighting Technology Roadmap*** is a plan for more efficient, more effective and more economical lighting. The roadmap envisions high-quality lighting systems that address today's challenges, such as a lack of standardization and a need for more sophisticated controls.

The technology roadmaps describe current industry issues and trends that will influence the building industry in the future, as well as barriers to be overcome. The roadmaps are intended to provide clear guidance to both the government and the private sector in planning future investments and initiatives.

For more information on the technology roadmaps, visit *www.eren.doe.gov/buildings/technology_roadmaps/.*

Warren Gretz—NREL/PIX04671

George James—NREL/PIX07634

David Parsons—NREL/PIX08226

Warren Gretz—NREL/PIX04117

Robb Williamson—NREL/PIX09221

Pictured, from top, are a Prairie Crossing home in Grayslake, IL; a Civano Development home in Tucson, AZ; the Van Geet home in Idaho Springs, CO; the National Renewable Energy Laboratory's Thermal Test Facility in Golden, CO; and the Zion National Park Visitor Center in Utah (see page 3 for more information on Zion).

# Elementary School Students Make a Difference in the Fight to Save Energy

Credit: Lewis Watts

**The four EnergySmart Schools Inventors built energy-saving devices with help from Berkeley Lab researchers and Owens Corning engineers.**

In January, while California tried to cope with its energy issues, four elementary school students from across the country convened in Berkeley, California, to build the energy-saving devices they invented.

DOE and the Lawrence Berkeley National Laboratory, in partnership with Owens Corning, are helping to shape and mold future energy scientists and engineers through the EnergySmart Schools Inventors Summit. Four elementary school students from across the country were selected as EnergySmart Schools Inventors based on their entries to the EnergySmart Schools Contest. The four winners built their award-winning inventions with Berkeley Lab scientists and Owens Corning engineers.

"Children have a remarkable ability to think up the most amazing things, which is exactly what the EnergySmart Schools Inventors did," said Glen Hiner, chairman and CEO of Owens Corning. "The inventors used their imaginations to develop original devices to save energy."

The four inventors were Annie Austin, a sixth-grader from Philadelphia, who created the Plugger to monitor the amount of electricity used in a house through electrical outlets; Kate Flor-Stagnato, a fourth-grader from Scotch Plains, New Jersey, who invented a Beeping Air Conditioner to signal homeowners that energy is being wasted; Jonathan Ioviero, a fifth-grade student from Medina, New York, who built a Light Searcher to search for lights left on in empty rooms; and Michael Torrey, a fifth-grader from Fremont, California, who created the Miniature Hydroelectric Power Plant that uses power from water to charge batteries for household usage.

In 1999, Owens Corning joined forces with DOE to enhance the EnergySmart Schools initiative, which was developed to make students, parents, teachers and school administrators aware of the serious problem of energy inefficiency in many of the 112,000 K-12 schools, as well as to help them implement viable solutions.

Visit the EnergySmart Schools Web site at *www.eren.doe.gov/energysmartschools/.*

# CD Offers Energy-, Water- and Money-Saving Tips


Energy headlines have been occurring across the country this year, and homeowners are looking for ways to save energy.

The Energy Savers Home Navigator CD, released from BTS, is an excellent resource. The size of a business card, the CD offers consumers 21 energy-, water- and money-saving opportunities in a concise, easy-to-use format.

The CD's interactive game-like approach engages the homeowner and provides access to more than 400 links to related Web pages. With this tool, consumers can learn how to choose and operate energy efficient and renewable technology solutions, building materials, appliances and equipment for homes and landscapes.

The Energy Savers Home Navigator CD was first introduced at the National Realtors Conference, where DOE's trade show supply was depleted the first day. Nearly 5,000 additional copies were ordered at the show.

A limited supply of free copies is available through the Energy Efficiency and Renewable Energy Clearinghouse. Call 1-800-DOE-3732 for copies. The CD operates in all PC and Mac machines with a tray-loading CD-ROM drive (it does not work in slot-loading machines).

# New York Fosters Energy Loans

New York is tackling one of the largest barriers to energy efficiency—financing. Through a network of 26 lending institutions, the New York Energy $mart℠ Loan Fund provides interest rate reductions for energy efficiency and renewable energy projects.

In terms of simple payback due to energy savings, the projects pay for themselves in five to ten years. During their useful lifetimes, however, they pay for themselves many times over, because projects involving buildings infrastructure or energy production are usually in place for 20 to 30 years. Because of the long-term timeline, their profitability is greatly enhanced by low-interest financing. Lenders reduce interest rates by 450 basis points, or 4.5%.

In February, the New York Energy $mart Loan Fund completed its first energy efficiency project at a cooperative apartment building in New York City, enabling the Brulene Cooperative Apartments in Queens to install new windows.

To pay for the windows, the co-op was able to borrow $250,000 at an interest rate of 5% from the Community Capital Bank of Brooklyn, New York. The bank handled the loan as a straightforward commercial transaction.

The program is one of more than 30 financed by a system benefits charge on the state's investor-owned electric utilities, established by the New York State Public Service Commission. The New York State Energy Research and Development Administration (NYSERDA) administers the system benefits charge funds and ensures that important research and development and energy efficiency services continue during the utilities' transition to competition.

Any New York commercial, industrial, retail, agricultural, non-profit or multi-family facility is eligible. NYSERDA has established a series of projects that automatically qualify for low-interest financing.

**Participation and Costs**

By March 2001, 26 organizations had applied for and received loans for energy projects valued at more than $1.6 million. Over the five years of the loans, the borrowers will benefit from interest rate reductions valued at more than $168,000 (in today's dollars adjusted for inflation). Once the program is fully subscribed, NYSERDA expects that New York ratepayers will save 54.2 million kilowatt-hours (kWh) of electricity annually and will realize demand reductions of 18.1 megawatts (MW).

NYSERDA has allocated $1.9 million for the first year of the loan fund. The agency expects to allocate a total of $10.7 million through 2006.

**Environmental Benefits**

Based on current projects, NYSERDA estimates that the New York Energy $mart programs reduce annual electricity consumption by 503 million kWh. By eliminating this amount of electricity every year, emissions of carbon dioxide are reduced by the equivalent of removing 85,100 automobiles from New York roadways.

The combined energy savings from electricity, oil and natural gas are expected to lead to the creation of 1,315 jobs in New York's service and retail trade sectors as a result of energy dollars being retained and reinvested in the local economies.

**Getting Lenders Involved**

Involvement of mainstream lending institutions distinguishes the New York Energy $mart Loan Fund from other government programs. As a result, consumers can finance energy projects the way they finance any other type of project. NYSERDA President William M. Flynn explains, "The loans are simple because customers can work with their existing banks. And there are no additional fees or paperwork to apply for these loans."

At the same time, involving lenders has been a relatively slow process compared with other projects in the Energy $mart program. One reason is the difficulty in marketing the program directly to customers to generate interest without first having financial institutions signed up. Without expressed interest from their customers, financial institutions have little incentive to implement such a program.

Once the program was in place, however, it quickly gained momentum. NYSERDA has found that participating banks are the agency's best sources of marketing. As soon as staff in the banks learn the simple procedures, banks are ready and willing to make loans. NYSERDA has also held workshops for banks and lending companies all over the state, and it provides participating banks with brochures to inform consumers about the fund.

The bottom line is the loan fund makes energy efficiency and renewable energy projects less expensive. At the same time, the fund encourages loans through New York's existing financial institutions. The loan fund benefits consumers by reducing their energy bills. The increased economic activity benefits the service and financial sectors of the state economy.

For more information, visit the New York Energy $mart Web site at *www.getenergysmart.org/nyserda_fin.htm.*

# Interactive CD Helps Teachers with Energy Lessons

A new resource will help teachers educate their students on one of the nation's most pressing issues—energy. *Get Smart About Energy*, an interactive CD with more than 250 lessons, was developed to help teachers understand and teach their students about energy sources, production, use and environmental impacts.

Selected by teachers with experience in energy education, the searchable lessons are aligned with the National Science Education Standards for grades K-4, 5-8, and 9-12.


*Get Smart About Energy* is organized to help teachers overcome many of the barriers they may face in teaching about energy—including time, accessibility and understanding. Instructors who compiled the material covered areas such as fairness, accuracy, depth of content, quality of learning, pedagogy and structure.

Activities are divided first by grade and then by the following categories: Energy Sources, Power Generation, Environmental Impacts and Energy Use.

Many lessons incorporate hands-on projects, and handouts and discussion topics are frequently provided. Topics range from energy efficiency and nuclear power to wind and the solar greenhouse effect, and the lessons use a number of disciplines, from art to physics.

For example, one lesson helps teachers lead students through a day-long diary exercise in which they track their electricity use and calculate the resulting amount of carbon dioxide added to the atmosphere. Another lesson helps students discover where air infiltration occurs in a building and research energy-saving window treatments.

DOE prepared the CD in cooperation with the Alliance to Save Energy, a coalition of business, government, environmental and consumer leaders who promote the efficient and clean use of energy worldwide.

*Get Smart About Energy* is available from DOE's Energy Efficiency and Renewable Energy Clearinghouse, 1-800-DOE-3732.

# Interactive Site Highlights Energy Efficient Technologies at Zion National Park

A new Web site features QuickTime VRs—360-degree panoramas—that highlight Zion National Park and its new energy efficient visitor center. The site includes an interactive map as well as a guided tour of the visitor center's technologies, which are environmentally friendly and save the park money.

BTS provided design support to improve the energy efficiency of the visitor center, which is expected to use 70 percent less energy than a typical building at no additional construction cost. Among the center's features are a Trombe wall, cooltowers, photovoltaic panels, daylighting and natural ventilation.

The interactive site is located on BTS's High Performance Buildings site at *www.eren.doe.gov/buildings/highperformance/zion/*. To view the site, you'll need the QuickTime Player, which you can download for free.

# Study Confirms ENERGY STAR® Clothes Washers Dramatically Reduce Energy and Water Use

While winter burdened consumers with swiftly rising heating costs, a Boston suburb had cause to celebrate. In Reading, Massachusetts, residents of the Summit Terrace Apartments achieved marked savings in energy and water use as participants in a DOE-sponsored demonstration project using high-efficiency clothes washers.

Credit: Maytag

**On average, the Neptune washers saved 50 percent of the energy, 41 percent of the water and 19 percent of the detergent when compared to conventional washers. The Neptune dryers used 22 percent less energy.**

An innovative public/private partnership between DOE, Maytag Appliances and Summit Terrace residents showed remarkable water and energy savings over a five-month test period. For the demonstration, Maytag donated and installed new ENERGY STAR labeled Neptune washers and matching dryers in 50 apartments at Summit Terrace. Oak Ridge National Laboratory monitored energy and water use before and after installation.

On average, the washers saved residents 50 percent of the energy, 41 percent of the water and 19 percent of the detergent when compared to conventional washers. Dryer energy consumption fell by 22 percent due to the higher spin speed of the washers (reducing water content in the clothes). DOE estimates that the new washers will save the building's residents 211,000 gallons of water annually, resulting in a savings of $2,380, based on current water rates.

If every Boston household used these machines, Boston residents could cut their energy bill by nearly $11 million per year and save enough power to run 14,000 homes. Plus, Boston could save more than 1.5 billion gallons of water annually.

The demonstration expands and validates a similar 1997 study conducted in rural Bern, Kansas, where the town's 204 residents achieved comparable savings.

"I am grateful to be a part of the Boston Washer Study," said Peg Fuller, a Summit Terrace resident. "The water and energy savings we've seen by using the Maytag Neptune will make a significant impact on our community, considering the water issues and high rates we've had the past few years. All I had to do was replace my old washer and dryer with a new one that actually cleans better and is gentler on my clothes. It's a win-win situation."

In addition to Maytag, many other appliance manufacturers produce ENERGY STAR labeled models. The efficiency of ENERGY STAR labeled appliances makes them less expensive to operate over their lifetime.

To learn more about ENERGY STAR and its products and partners, visit the Web site at *www.energystar.gov*, or call the ENERGY STAR hotline at 1-888-STAR-YES.

For additional information on the Boston Washer Study, please call John Tomlinson, Oak Ridge National Laboratory, 865-574-0291.

# DOE Releases Building Energy Simulation Software

EnergyPlus

In April, Energy Secretary Spencer Abraham announced the release of a next-generation building energy computer simulation program that allows architects, engineers and building owners and managers to minimize energy use and cost and optimize building performance. The EnergyPlus program is a significant step beyond existing DOE software, which has saved building owners and designers an estimated $20 billion.

"The Department of Energy's EnergyPlus computer simulation program will assist designers and building owners in dramatically lowering energy use in buildings," said Secretary Abraham. "We want to help design teams and building owners and managers achieve energy efficiency even with tight scheduling constraints and significant dollars at stake."

EnergyPlus simulates whole-building approaches in design, planning and construction and opens new doors for energy savings, cost savings and indoor environmental quality enhancements. It allows users to calculate impacts of different heating, cooling and ventilating equipment and various types of lighting and windows to maximize building energy efficiency and occupant comfort.

EnergyPlus can be downloaded at no cost from *www.eren.doe.gov/buildings/energy_tools/energyplus/*.

# Atlanta Regional Office Takes a Green Path to Energy Efficiency

In Stanley Kubrick's film ***Full Metal Jacket***, two American soldiers in Vietnam are bragging about who has shown the most bravado. The first says to the second, in his best John Wayne imitation, "Yeah, pilgrim, you can talk the talk, but can you walk the walk?"

The Atlanta Regional Office (ARO), the southeastern field office of DOE's Office of Energy Efficiency and Renewable Energy, decided to walk the walk when it came to outfitting its new office space.

The ARO worked in partnership with the Sunbelt Region Office of the General Services Administration, which was using a Federal Energy Management Program Super Energy Saving Performance Contract to make improvements in the Richard B. Russell Federal Building and U.S. Courthouse in Atlanta. Under the initiative "Taking a Green Path to Energy Efficiency," the ARO retrofit the office space with as many energy efficient technologies and products as feasible.

The result is a 10,000-square-foot office space featuring carpeting manufactured from recycled materials, recycled wooden doors, recycled acoustical ceiling tile, ceramic floor tiles manufactured from recycled materials, paints with low volatile organic compounds, recyclable state-of-the-art office furniture, and ENERGY STAR® appliances such as personal computers, refrigerators, a dishwasher, copiers and fax machines.

Throughout the office, photocell-controlled electric lights supplement daylighting. Individual workstations feature energy-saving fluorescent task lighting, desktop motion sensor lighting and electrical outlet controls. In overhead fluorescent lights, fixtures were recycled, and magnetic ballasts were replaced with electronic ballasts. Some fixtures are dimmable, and all have efficient reflectors. Where there had been four T12 fluorescent lamps, there are now two T8 lamps. Occupancy lighting sensors are used in all common areas, such as the kitchen, library, and mail and file rooms. Annual energy savings from all of these technologies and products is estimated to be 96,000 kilowatt-hours.

ARO Director Jim Powell had been planning for several years to house DOE's regional operations in space that would serve as a showcase for the public. The ARO found office space in the federal building, which had just received major energy upgrades, and it used green design standards to further improve the offices. As Jim likes to say, "ARO is walking the walk with energy efficiency and sustainable design!"

For more information, visit the ARO Web site at *www.eren.doe.gov/aro/*.

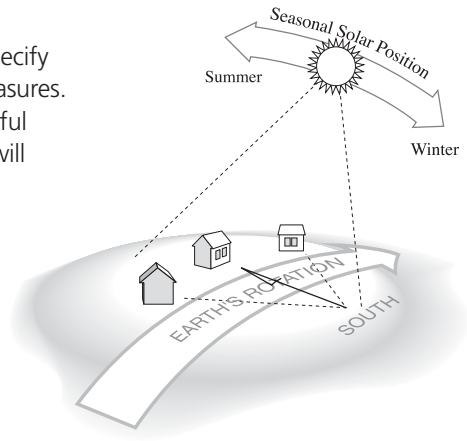
# BTS Meetings, Events & Conference Calendar

| Date | Meeting, Event, Conference | Contact |
|---|---|---|
| July 24–27 | PCBC The Premier Building Show<br>San Francisco, CA | www.pcbc.com/ |
| July 24–27 | American Council for an Energy-Efficient Economy<br>Tarrytown, NY | www.aceee.org/conf/indindex.htm |
| Sept. 5–8 | HVAC Comfortech 2001<br>Nashville, TN | www.contractingbusiness.com/comfortech/index.html |
| Sept. 16–19 | National Association of State Energy Officials<br>Portland, ME | www.naseo.org/events/annual |
| Oct. 16–19 | National Association for State Community Services Programs<br>Seattle, WA | www.nascsp.org/events/events.htm |
| Oct. 24–27 | EEBA Excellence in Building Conference & Expo<br>Orlando, FL | www.eeba.org/conference |
| Nov. 2–5 | Realtors Conference & Expo<br>Chicago, IL | www.narconvention.org |

# Technology Fact Sheets Guide Energy Efficient Construction

A new series of technology fact sheets will help housing designers and builders adopt a whole-house design approach and energy efficient design practices. Nearly half of the two dozen BTS fact sheets are complete, including such topics as advanced wall framing, attic access, wall insulation and weather-resistive barriers.

The four-to-six-page fact sheets describe how to approach energy efficient improvements, design and specify energy efficient features and install energy efficient measures. The series focuses on new construction, but can be useful in building rehabilitation. A subsequent, shorter series will address existing buildings.




Passive solar design is described in a technology fact sheet developed for housing designers and builders.

The technology fact sheets focus on wood-frame construction and mainstream technologies, and address energy efficiency questions often raised by housing program managers and construction foremen. The series also emphasizes that achieving energy efficiency does not require higher first costs, skill levels beyond the reach of current workers, or use of new, unfamiliar materials or methods of construction.

The series takes a systems approach to design and construction, considering the interaction between the site, building envelope, mechanical systems, occupants and other factors. This approach also recognizes that one component of a house can greatly affect others.

Public housing authorities, affordable housing providers and state energy offices will particularly benefit from the detailed series.

The fact sheets were written and prepared through a partnership of the National Association of Home Builders' Research Center, Southface Energy Institute, DOE's Oak Ridge National Laboratory, and DOE's National Renewable Energy Laboratory. For printed fact sheets, contact the Energy Efficiency and Renewable Energy Clearinghouse (EREC) at 1-800-DOE-3732 or doe.erec@nciinc.com. The fact sheets are also available online at *www.eren.doe.gov/buildings/documents/* under Technology Fact Sheets.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If you would like to make suggestions or contribute articles to the newsletter, please address mail to Margo Appel (address below) or e-mail Margo.Appel@ee.doe.gov.

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